Technology Requirements for the Indian Navy

Vice Admiral Satish Soni, PVSM, AVSM, NM (Retd)[@]

Introduction

Indo-Pacific is now an arena of geopolitical contest and the Indian Ocean is witnessing an increased presence of International warships and submarines, in particular of the Chinese, ostensibly to protect their commercial interests. Increased focus on Blue Economy, presence of offshore oil and gas reserves, dividends from seabed mining, requirement to preserve depleting fish stock and a renewed focus on Maritime Security is encouraging littorals to build naval capacities and capabilities, with the assistance of more powerful navies, both regional and extra regional.

The Indian peninsula flanked by the Andaman and Nicobar Islands in the East and the Lakshadweep in the West dominates the Sea Lanes of Communication (SLOC) through which over 70,000 ships transit every year. The Indian Navy has the sea legs and the mobility to reach distant choke points that provide access to the Indian Ocean. Given the mandate to be a net provider of security to the many island nations, the Indian Navy needs to balance threats, inherent risks and rising challenges in the maritime environment against the ability to monitor, contain and counter them. Needless to add that creation of such conditions would support our maritime interests as well.

In order to achieve this, the Indian Navy must not only improve its force levels, fill in the capability gaps but also harness and exploit disruptive technologies. A robust ship and submarine design organisation, 48 Defence Research and Development Organisation (DRDO) laboratories and other facilities supported by a fledgling military Industrial complex have so far met some of our aspirations towards self-reliance.

[@]**Vice Admiral Satish Soni, PVSM, AVSM and NM (Retd)** superannuated from the Indian Navy on 29 Feb 2016. He has held the appointments of Flag Officer Commanding-in-Chief Eastern Naval Command, Flag Officer Commanding-in-Chief Southern Naval Command, Deputy Chief of Naval Staff, Commandant National Defence Academy and Chief of Staff Eastern Naval Command. He has done staff tenures in the Indian Navy's Directorates of Personnel and Plans.

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In 2015, the Indian Navy redefined the Indian Naval Indigenisation Plan (INIP 2015-2030), outlining projects for a new phase of self-reliance. This is in consonance with the Ministry of Defence's (MOD) Technology Perspective and Capability Roadmap (TPCR 2013).

The Indian Navy and DRDO have an overarching policy agreement to enhance cooperation. To this end, regular "Synergy Meetings" are held to review the 93 critical technologies being pursued. The Technical Development Fund (TDF) and Integrated Indigenously Designed Developed and Manufactured (IDDM) initiatives taken recently should give impetus to the 'Make in India' drive. There have been some collaborative efforts which have made a significant impact in improving our capabilities. *Arihant SSBN,* BRAHMOS supersonic missile and the Medium Range Surface- to-Air Missile *Barak-8* have been path breaking. Huge investments have been made in many other projects but dividends have not been commensurate.

The technologies that Indian Navy would want to exploit in the near future are either already available with advanced countries or are being researched by them. We would need to either collaborate with them or invest in research and development to find suitable answers. These are discussed in this article under the following broad heads: -

(a) Advanced Munitions.

(b) Unmanned Combat.

(c) Space.

(d) Network-Centric Warfare.

(e) Cyber Warfare.

(f) Air Craft Carrier Technology.

(g) Challenges.

Advanced Munitions

Our successes in development of long range missiles i.e. from the *Prithvi* to *Agni* series have been creditable but we still have to make any headway in advanced munitions. The cruise missile programme "Nirbhay" is extremely important to us for the options

that become available in littoral warfare. Smart munitions such as Drone Launched Guided Missiles and Loitering Missiles, which can limit collateral damage and have the flexibility of being launched by a variety of platforms, have several advantages for the sheer versatility and flexibility of usage.

Directed Energy Weapons (DEWS) i.e. beams of concentrated Electromagnetic energy or subatomic particles are going to be the weapons of choice in future on account of the advantages of safety, high accuracy, unlimited use and cost effectiveness. DRDO has claimed initial success with a 10kw beam effective up to 800 metres and is working on an array of systems from chemical oxygen iodine lasers to high power fibre lasers.

The challenge lies in developing solid state laser DEWs which can destroy enemy missiles in the booster phase, somewhat akin to Laser Weapon System (LAWS) being tested by the US. The US Navy is also testing a quick response Electromagnetic Railgun that fires projectiles using electricity instead of chemical propellants. With its increased velocity and extended range (greater than 100 miles), the electromagnetic Railgun will provide ships with a multi-mission capability. Acquisition of this capability with or without foreign collaboration will give us a force multiplier at sea.

Unmanned Combat

Autonomous unmanned combat vehicles that can operate in the air, on the surface and under the surface are of great interest to all navies because of their ability to remain on task for extended periods of time and extend combat operations into the adversary's anti- access/area denial zone. The Indian Navy operates the Heron and Searcher class of Unmanned Air Vehicles (UAVs) and has a programme for arming the UAVs and developing a bigger and more capable platform i.e. Rustom. DRDO is also developing an Autonomous Sea Vehicle akin to a submarine drone.

Precision guidance to avoid collateral damage, advanced artificial intelligence to enable decision making, a good collision avoidance system, exploitation of Internet of Everything (IOE) technology and better satellite coverage are some of the pre-requisites for success.

India should explore the feasibility of co-developing with the United States the technologies of their on-going projects such as,

Anti-Submarine Warfare Continuous Trail Unmanned Vessel (ACTUV) that looks for submarines in a given area and reports detection to the fleet, SHARK – an underwater submarine hunting probe; "Upward falling Loads" which remain dormant on the sea bed and rise on demand; X-47 unmanned aircraft and the vertical take-off and landing naval drone; the Tactically Exploited Reconnaissance Drone (TERN).

It is learnt that the research on Boeing's Solar Eagle, a self-sustaining UAV, powered by solar energy with an endurance of five years has been stopped but we could expect development of such capabilities in the future and explore the possibility of co-development in this project too.

Space

George Friedman, the founder and CEO of the think tank Stratfor till 2015, in his book *'The Next Hundred Years',* published in 2010, predicts the First Space War in 2050. A war, in which pre-emptive strikes will be launched from lunar bases at the Spatial Command and Control stations with an aim to achieve superiority in space.

In this first space war, the author has visualised extensive use of Unmanned Hypersonic Aircraft, Anti- Satellite Missiles, High Energy Lasers, Armoured Infantry Men, Robotic Logistics, Unmanned Air Vehicles, and Precision Guided Missiles etc. Whilst the scenario is fictional, space is certainly the new dimension that aspiring powers are looking at to boost their capabilities.

Currently, there is only one International Space Station being managed by five participating agencies (US, Russia, Canada, Europe and Japan). Chinese have plans to man another one by 2020. There could be as many as 500 military satellites in geostationary and low elliptical orbits, being used for reconnaissance, communications (including for Electro Magnetic Support Measures (ESM)) and navigation. Anti-satellite systems have been tested by the Chinese, US and Russia.

The Indian Space Research Organisation launched a lunar probe in 2008, sent an unmanned rocket to orbit Mars in 2013. It has established a world record of launching 104 satellites into orbit in one go and has demonstrated a capability to put humans in space. But our capabilities for exploiting space for military applications remain limited to the *Cartosat* series, the first Naval

satellite *Rukmani* and a few spinoffs from the Indian Regional Satellite System (IRNSS) programme.

Rukmani has changed the way Naval Forces operate at sea. The ability to exchange positional information and communicate on a real time has enabled widely dispersed task forces to operate all over the Indian Ocean. We must plan for additional military satellites for reconnaissance and communication with advanced space based sensors, launch of on demand mini-satellites, instant imaging, Anti Satellite (ASAT) weapons, Anti-Ballistic Missile system, Electro-magnetic Pulse (EMP) hardening of satellites to protect against ASAT weapons and a launch of ESM constellation of satellites to determine position of units at sea. The Integrated Space Cell must grow into a Space Command to shortlist and follow up specific initiatives.

Network-centric Warfare

The Indian Navy aims to achieve full spectrum dominance at sea from peacetime operations to application of military power by having credible information superiority. Our efforts include putting *Rukmani* in space, development of UHF, KU, C and S band transponders, indigenous development of Software Defined Radios, a common Combat Management System, commissioning of the Information Management and Analysis Centre (IMAC) and the IRNSS programme.

Indigenous software defined radios will give us the ability to communicate over longer ranges in complete secrecy. Auto modulation and change of frequency will enable jam-proof communication. Exploitation of Multi Input Multi Output (MIMO) technology will reduce requirement of more sets and antennae. But there are some technology gaps. We continue to depend on the GPS and haven't been able to integrate information from all the available sources for a perfect situational awareness on individual units at sea. Also, we need to have a global footprint. Launch of more satellites and early conclusion of our efforts at information integration is recommended.

Cyber Warfare

Whilst Stuxnet that sabotaged Iran's Natanz Uranium enrichment plant in Nov 2007 was an isolated example of cyber warfare, today, exploitation of this dimension is rampant. In the first fortnight

of April this year, there were 40 reported cases of cyber-attacks on economic and military targets. Last month, the hacking group 'Shadow Brokers' infected 2,00,000 systems all over the world for a ransom of $300 per rectification. A cyber-attack essentially exploits weaknesses in a software programme and injects malware to disable systems. It is manpower intensive. The US Cyber Command is expected to have 6200 military and civilian contractors divided into 13 teams by 2018 to hunt down online intruders.

The Indian Navy is becoming increasingly dependent on data processing and Network Centricity, which makes it extremely vulnerable to Information Warfare campaigns. Capabilities with the National Technical Research Organisation (NTRO), Defence Information Assurance and Research Agency (DIARA), Service Headquarters, DRDO and other government agencies need to be integrated and grouped under one organisation. Commissioning of a dedicated and integrated cyber organisation is recommended.

Aircraft Carrier Technology

Sanctioned in 2001, the keel for the first Indigenous Aircraft Carrier (IAC-1) was laid in 2009 and the ship was launched in 2013. Sea trials are expected to commence in 2018, which is a fairly long timeline. There is certainly a need to build more and bigger aircraft carriers in quicker timeframes and the Navy has ambitions to assimilate and integrate several advanced technologies such as the Electro Magnetic Launch System (EMALs), Advanced Arrester Gear (AAG) and Integrated Full Electrical Propulsion (IFEP)/ Nuclear Propulsion. In order to condense the time lines and monitor indigenisation of new technologies, we could examine setting up Advanced Technology Project (ATV) type of structures which oversees construction of the SSBNs.

Challenges

The Defence Procurement Procedure (DPP) aimed at simplifying acquisition processes has gone through eight iterations and yet no big-ticket acquisition barring the P-8I has been concluded for the Indian Navy. The acquisition of 16 Multi Role Helicopters has taken over 15 years of processing without any positive results and could serve as a case-study to identify shortcomings in our system. If we can't resolve the bureaucratic maze of the acquisition process, we will never be able to imbibe technology.

Whilst the wish list of the Navy and the Technology Perspective and Capability Road map (TPCR) issued by the MOD is elaborate, it is extremely ambitious to be met by our defence industrial establishment, which neither has the infrastructure nor the resources for Research and Development. Foreign companies are willing to collaborate but resist transfer of technology. Hopefully, the new 'Strategic Partnership' guidelines will overcome this lacuna.

The DRDO laboratories have done well in spurts only to lag behind. Initial gains have not been consolidated and the claims are often exaggerated. There is a need for stringent performance audits. User interface needs improvement. The present strength of 39 naval officers in DRDO is clearly inadequate.

Conclusion

Technology superiority is going to be a decisive factor in future battles. The capabilities of our military industrial base and DRDO are somewhat modest in terms of trained human resource, capital outlays and facilities available for Research and Development. The disruptive technologies discussed here may appear to be distant dreams but can be realised by a strategy of leap frogging development and active collaboration on Government-to-Government contracts or Strategic Partnerships. The high costs should be offset by developing ecosystems that facilitate exports.

Exploitation of space, capabilities to network at sea to achieve battle space transparency, unarmed combat, specialised munitions and cyber warfare are the core areas we must focus on. Setting up an ATV type structure to facilitate assimilation and integration of advanced technologies for building modern aircraft carriers is recommended.